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Indian Standard

RESPIRATORY PROTECTIVE DEVICES — MOUTHPIECE ASSEMBLIES — SPECIFICATION

UDC 614·894·24

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

December 1994 Price Group 4

Industrial Safety Sectional Committee, CHD 008

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Industrial Safety Sectional Committee had been approved by the Chemical Division Council.

A mouthpiece assembly is a device (facepiece), held by the teeth, sealing against the lips, and through which air is inhaled and exhaled while the nose is blocked up by a clip. Air enters the mouthpiece and passes directly into the mouth. The exhaled air flows back either through the facepiece connector into the breathing apparatus (closed-circuit breathing apparatus, pendulum breathing) or directly to the ambient atmosphere, via the exhalation valve(s), in other types of respiratory protective devices.

This standard refers to mouthpiece assemblies for respiratory protective devices, except escape apparatus sampling and diving apparatus.

A given respiratory protective device is considered to be conforming to this standard when the individual components satisfy the requirements of the test specification which may be a complete standard or part of a standard, and practical performance tests have been carried out on complete apparatus where specified in the appropriate standard. If for any reason a complete apparatus is not tested then simulation of the apparatus is permitted provided the respiratory characteristics and weight distribution are similar to those of the complete apparatus.

This standard has been prepared in line with EN 142 : 1989 'Respiratory protective devices; Mouthpiece assemblies; Requirements, testing and marking', published by European Committee for Standardization and is technically equivalent to it.

The composition of the committee responsible for formulation of this standard is given in Annex C.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

RESPIRATORY PROTECTIVE DEVICES — MOUTHPIECE ASSEMBLIES — SPECIFICATION

1 SCOPE

This standard prescribes requirements and their methods of tests for mouthpiece assemblies for use as a part of respiratory protective devices except escape apparatus, sampling and diving apparatus.

2 REFERENCES

The following Indian Standards are necessary adjuncts to this standard:

IS No.	*Title*
4905 : 1968	Methods for random sampling (*Reaffirmed in 1991*)
8347 : 1977	Glossary of terms relating to respiratory protective devices (*Reaffirmed in 1991*)
14138 (Part 1) : 1994	Respiratory protective devices; Threads for facepieces : Part 1 Standard thread connection
14138 (Part 2) : 1994	Respiratory protective devices : Part 2 Threads for facepieces; centre thread connection

3 TERMINOLOGY

For the purpose of this standard the definitions given in IS 8347 : 1977 shall apply.

4 REQUIREMENTS

4.1 Material

Exposed parts which may be subjected to impact during use of the apparatus shall not be made of aluminium, magnesium, titanium or alloys containing such proportions of these metals as which on impact give rise to frictional sparks capable of igniting flammable gas mixtures.

4.2 Cleaning and Disinfecting

The materials used shall withstand the cleaning and disinfecting agents as recommended by the manufacturer.

4.3 Replaceable Components

The components of the mouthpiece assembly shall be replaceable.

4.4 Practical Performance Test

The complete apparatus shall pass the practical performance tests under realistic conditions. These general practical performance tests serve the purpose of checking the equipment for imperfections that cannot be determined by the tests described in other parts of this standard.

In addition to the tests described in this standard details of practical performance tests for breathing apparatus are given in the respective Indian Standards. Where a mouthpiece assembly is to be used for filtering devices, testing shall be in accordance with the requirements for full face masks. The tests described in other standards have to be run with the exemption of speaking.

Where in the opinion of the test station approval is not granted because practical performance tests show the apparatus has imperfections related to wearer's acceptance, the test station shall provide full details of those parts of the practical performance tests which revealed these imperfections. This will enable other test stations to duplicate the tests and assess the results thereof.

4.5 Inward Leakage of Facepiece

A mouthpiece shall be so designed that inward leakage between lips and mouthpiece is negligible. In addition inward leakage may occur through exhalation valves (if fitted) and connections. The inward leakage through the exhalation valve(s) shall not exceed 0·01 percent when tested in accordance with Annex A.

4.6 Compatibility with Skin and Mouth

Materials that may come into contact with the wearer's skin and mouth shall not be known to be likely to cause irritation or any adverse effect to health and the manufacturer shall give a declaration along with the apparatus to this effect.

4.7 Head Harness

4.7.1 The head harness shall be so designed that the mouthpiece assembly can be donned and removed easily.

4.7.2 The head harness shall be adjustable and shall hold the mouthpiece assembly firmly and comfortably in position.

4.8 Connector

The connection between the rest of the apparatus and the mouthpiece assembly may be achieved by a permanent/special type of connection as agreed by the purchaser and the supplier or by a standard thread connection.

4.8.1 *For Breathing Apparatus Except Close Circuit Breathing Apparatus*

Standard thread connection may be used as the mouthpiece assembly connection for all respiratory protective devices, except closed-circuit breathing apparatus and positive pressure demand breathing apparatus.

If a standard thread connection is used then the relevant requirements of IS 14138 (Part 1) : 1994 shall be satisfied.

4.8.2 *For Closed Circuit Breathing Apparatus*

Centre thread connection be used as the mouthpiece assembly connection for closed-circuit breathing apparatus. If a centre thread connection is used then the relevant requirements of IS 14138 (Part 2) : 1994 shall be satisfied.

4.8.3 The connection between mouthpiece and connector shall be gas-tight and robust.

4.8.4 All demountable connections shall be readily connected and secured, where possible by hand. Any means of sealing used shall be retained in position when any connection is disconnected during normal maintenance.

4.8.5 Correct and reliable connection between facepiece and other parts of the respiratory protective device shall be assured.

4.9 Inhalation and Exhalation Valves

Valve assemblies shall be such that they can be readily maintained and correctly replaced. It shall not be possible to fit an exhalation valve assembly into the inspiratory circuit or an inhalation valve assembly into the expiratory circuit. Normally a mouthpiece assembly with centre thread connection shall not have valves.

4.9.1 *Inhalation Valve(s)*

4.9.1.1 A mouthpiece assembly except one with a centre thread connection should preferably be provided with one or more inhalation valve(s). If a standard thread type of connection is used an inhalation valve shall be incorporated in the mouthpiece assembly. If a mouthpiece assembly has to be used with filters it shall be provided with an integral inhalation valve, if there is no valve in the filter.

4.9.1.2 Inhalation valves(s) shall function correctly in all orientations.

4.9.2 *Exhalation Valve(s)*

4.9.2.1 Exhalation valve(s) shall function correctly in all orientations.

4.9.2.2 A mouthpiece assembly with a standard thread connection shall have at least one exhalation valve to allow the escape of exhaled air and, where applicable, any excess air delivered by the air supply.

4.9.2.3 The exhalation valve(s) shall be protected against dirt and mechanical damage and shall be shrouded or shall include any other device that may be necessary to comply with **4.5**.

4.9.2.4 The exhalation valve(s) shall continue to operate correctly after a continuous exhalation flow of 300 l/min over a period of 1 min.

4.10 Breathing Resistance

The apparatus shall pass the test when tested in accordance with Annex B.

4.10.1 The breathing resistance of a mouthpiece assembly shall not exceed the values given in **4.10.2** and **4.10.3** respectively.

4.10.2 *With Standard Thread Connection*

The breathing resistance shall not exceed 1·5 mbar[1)] for inhalation and 3·0 mbar[1)] for exhalation (25 × 2 l/min with breathing machine or 160 l/min continuous flow).

The inhalation resistance shall not exceed 0·5 mbar[1)] at 30 l/min continuous flow and 1·0 mbar[1)] at 95 l/min continuous flow.

4.10.3 *With Centre Thread Connection*

The breathing resistance shall not exceed 0·6 mbar for inhalation or exhalation.

This requirement does not apply to mouthpiece assemblies which contain valves or other components as an integral part of the assembly when used with closed-circuit breathing apparatus.

4.11 Restriction of Air Flow

The mouthpiece shall be so constructed that the air flow is not restricted unintentionally when the mouthpiece assembly is being worn.

4.12 Nose Clip

The nose clip shall be designed to afford maximum security against accidental displacement. It shall not slip when the nose becomes moist with perspiration, and suitable means shall be provided for attaching it to the apparatus to prevent loss.

The parts of the nose clip shall be designed not to cause burns, when used in hot environment.

[1)] 1 mbar = 10^2 N/m^2 = 0·1 kPa.

5 MARKING

5.1 All units of the same model shall be provided with a type identifying marking. Sub-assemblies and components with considerable bearing on safety shall be marked so that they can be identified. The manufacturer shall be identified by name, trade-mark or other means of identification.

5.2 Where the reliable performance of components may be affected by ageing, means of identifying the date (at least the year) of manufacture shall be marked. For parts which cannot be marked the relevant information shall be included in the instructions for use.

5.3 The marking shall be as clearly visible and as durable as possible.

5.4 BIS Certification Marking

The product may also be marked with the Standard Mark.

5.4.1 The use of the Standard Mark is governed by the provisions of Bureau of Indian Standards Act, 1986 and the Rules and Regulations made thereunder. The details of conditions under which the licence for the use of Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

6 INSTRUCTIONS

6.1 On delivery instructions for use shall accompany every mouthpiece assembly.

6.2 Instructions for use shall be in a language acceptable to the country of application.

6.3 The instructions for use for the equipment shall contain all information necessary for trained and qualified persons on:

- application/limitation,
- checks prior to use,
- donning, fitting,
- use,
- maintenance, and
- storage.

6.4 The instructions shall be unambiguous. If helpful, illustrations, part numbers, marking, etc, shall be added.

6.5 Warning shall be given against problems likely to be encountered, for example:

- fit of facepiece (check prior to use);
- leakage caused by facial hair;
- hazards of oxygen, oxygen-enriched air and any other toxic gases;
- air quality; and
- use of equipment in explosive atmosphere.

7 SAMPLING AND CRITERIA FOR CONFORMITY

7.1 In a single consignment, all the mouthpiece assemblies, assembled under uniform conditions of manufacture on the same day, shall constitute a lot.

7.1.1 Each lot shall be tested separately for ascertaining the conformity of the lot to the requirements of the specification. The number of mouthpieces to be selected from the lot shall depend upon the size of the lot and shall be in accordance with Table 1.

Table 1 Number of Samples to be Selected from the Lot

(*Clauses* 7.1.1 *and* 7.2.1)

No. of Mouthpieces in the Lot (1)	No. of Mouthpieces to be Selected in a Sample (2)
Up to 50	8
51 to 150	13
151 and above	20

7.1.2 The mouthpieces shall be selected at random from the lot. For this purpose, reference may be made to IS 4905 : 1968.

7.2 Number of Tests

7.2.1 Each of the face masks selected from the lot according to col 2 of Table 1 shall be examined for visual inspection (*see* **4.3**, **4.8**, **4.9** and **4.12**).

7.2.1.1 The lot shall be considered to have satisfied the above requirements if none of the masks in the sample fails. Otherwise, the lot shall be rejected.

7.2.2 The sample having been found satisfactory as per **7.2.1** shall be further tested for the requirements of breathing resistance (**4.10**), practical performance test (**4.4**), and cleaning and disinfection (**4.2**), in this sequence.

7.2.2.1 The lot shall be considered to have satisfied the above requirements if there is no failure in the sample. Otherwise, the lot shall be rejected.

7.2.3 Approximately half the number of face masks, out of the sample already found satisfactory as per **7.2.2** shall be tested for inward leakage of face piece (**4.5**), and exhalation valves (**4.9.2**).

7.2.3.1 The other half of the sample shall be tested for the requirements of inward leakage of face piece (**4.5**), head harness tests (**4.7.1** and

4.7.2), face piece connector (**4.8**), inhalation valves (**4.9.1**), and performance tests (**4.9.2.4**) and exhalation valves housing (**4.9.2.3**).

7.2.4 The lot shall be considered as conforming to the requirements of the specification if all the facepieces pass in the requirements specified in **7.2.3**. Otherwise the lot shall be rejected.

ANNEX A

(*Clause* 4.5)

METHOD OF TEST FOR EXHALATION VALVE LEAKAGE

A-1 TEST EQUIPMENT

Test equipment consists mainly of:

a) a small volume (volume: 1 to 1·2 l) leak tight box attached to a tube, with opening(s) between the box and tube in which the valve assemblies are mounted in suitable adapters of low dead space (*see* Fig. 1). There are baffle plates in the box to promote smooth test gas flow (100 l/min continuous flow);

b) a breathing machine delivering sinusoidal air flows corresponding to 20 strokes/min and 1·5 l/stroke;

c) a supply of carbon dioxide;

d) a purifier containing absorbent for carbon dioxide;

e) a unit to saturate the air with water vapour at 37°C; and

f) an instrument capable of measuring test gas concentrations.

A-2 TEST PROCEDURE

A-2.1 All the exhalation valve assemblies attached to the mouthpiece body are tested.

A-2.2 The test shall be performed at ambient temperature and relative humidity. The valve assemblies under test shall be fitted into the box with a suitable adaptor in a vertical position. The components shall be arranged according to whether a single or twin cylinder breathing machine is to be used (*see* Fig. 2 and 3).

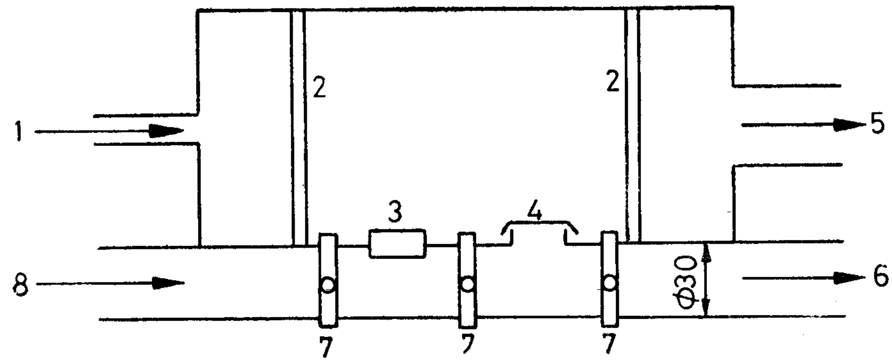
A-2.3 The inlet valve shall be adjusted so that the back pressure of the valve(s) is 1 to 1·5 mbar at 30 l/min continuous flow.

A-2.4 The breathing machine shall be set at 1·5 l/stroke, 20 strokes/min. A flow of test gas shall be maintained through the box. Samples of the air from before and after the valve assemblies shall be continuously analysed for test gas concentrations.

A-2.5 The test shall be run for a sufficient time to obtain a steady reading of the test gas concentration in the inspiratory air stream.

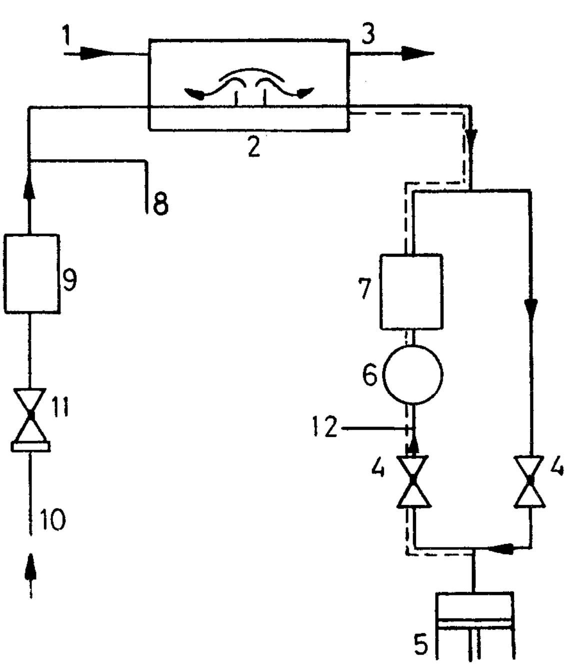
A-2.6 The difference in the test gas concentrations between the two samples is a measure of the total valve leakage.

The test shall be carried out using carbon dioxide.



1	Test gas in	5	Test gas out
2	Baffle plates	6	To breathing machine
3	Blanking plate	7	Pressure measurement ports
4	Valve under test	8	Saturated gas in

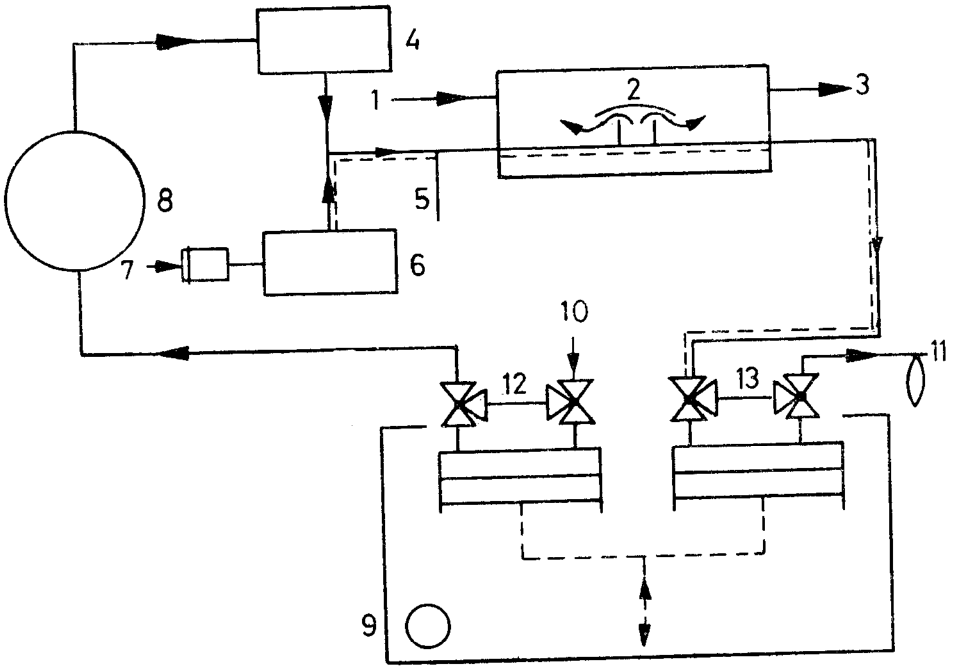
FIG. 1 SCHEME OF EXHALATION VALVE LEAKAGE TEST BOX



1 Test gas in
2 Valve under test
3 Test gas out
4 Breathing machine valves
5 Breathing machine
6 Saturator
7 Purifier
8 Reference gas sample
9 Purifier
10 Laboratory air in
11 Adjustable non-return valve
12 Test gas sample

The difference between concentrations of samples taken at points 8 and 12 is a measure of the valve leakage.

FIG. 2 SCHEME OF TEST RIG FOR VALVE LEAKAGE USING A SINGLE CYLINDER MACHINE



1 Test gas in
2 Valve under test
3 Test gas out
4 Purifier
5 Reference gas sample
6 Purifier
7 Laboratory air in through adjustable non-return valve
8 Saturator
9 Twin cylinder breathing machine
10 Laboratory air in
11 Test gas sample
12 Breathing machine valves
13 Breathing machine valves

The difference between concentrations of the samples taken at points 5 and 11 is a measure of the valve leakage.

FIG. 3 SCHEME OF TEST RIG FOR VALVE LEAKAGE USING A TWIN CYLINDER BREATHING MACHINE

ANNEX B

(*Clause* 4.10)

METHODS OF TEST FOR BREATHING RESISTANCE

B-1 PROCEDURE

B-1.1 The breathing resistance shall be measured using a breathing machine adjusted to 25 strokes/min and 2·0 l/stroke or a continuous flow of 160 l/min. A suitable pressure transducer shall be used.

B-1.2 The inhalation resistance shall be also measured at 30 and 95 l/min continuous flow.

B-1.3 The resistance value shall be corrected to 27°C and 1 bar absolute.

ANNEX C

(*Foreword*)

COMMITTEE COMPOSITION

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This Indian Standard has been developed from Doc No. CHD 008 (0522)

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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Printed at New India Printing Press, Khurja, India